

### Bi-Directional DC Motor Driver

The KIA7291P/S/F are bridge driver with output voltage control.

#### FEATURES

- 4 Modes Available (CW/CCW/STOP/BRAKE)
- Output Current : P type 1.0A(AVE.) 2.0A(PEAK)  
S/F type 0.4A(AVE.) 1.2A(PEAK)
- Wide Range of Operating Voltage :  $V_{CC(opr)}=4.5\sim 20V$   
:  $V_{S(opr)}=0\sim 20V$   
:  $V_{ref(opr)}=0\sim 20V$   
:  $V_{ref}\leq V_S$
- Build in Thermal Shutdown, Over Current Protector and Punch-Through Current Restriction Circuit.
- Stand-by mode available (STOP MODE)
- Hysteresis for All Inputs.

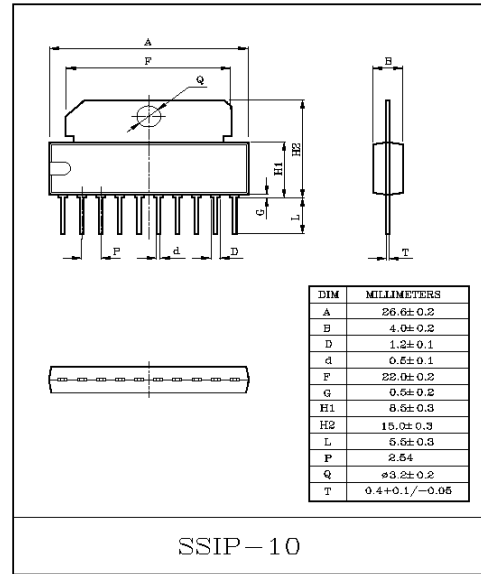
#### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		$V_{CC}$	25	V
Motor Drive Voltage		$V_S$	25	V
Reference Voltage		$V_{ref}$	25	V
Output Current	PEAK	P TYPE	2.0	A
		S/F TYPE	1.2	
	AVE.	P TYPE	2.0	
		S/F TYPE	0.4	
Power Dissipation	P TYPE	$P_D$	(*1) 12.5	W
	S TYPE		(*2) 0.95	
	F TYPE		(*3) 1.40	
Operating Temperature		$T_{opr}$	-30~75	°C
Storage Temperature		$T_{stg}$	-55~150	°C

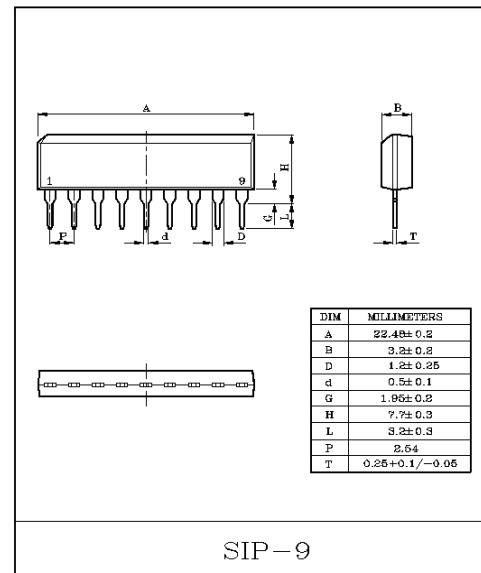
(\*1)  $T_C=25^\circ C$  (KIA7291P)

(\*2) No heat sink

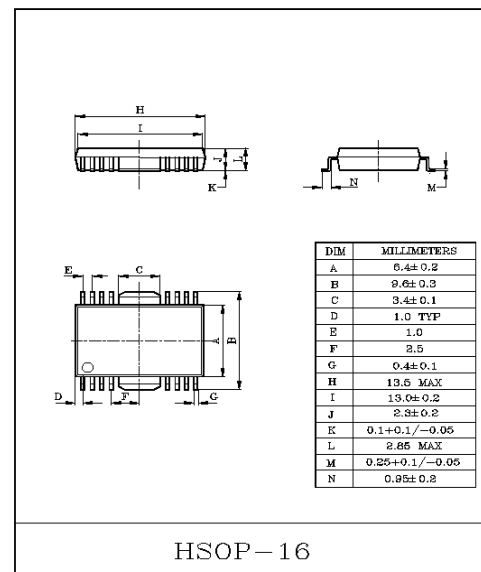
(\*3) PCB (60×30×1.6mm, occupied copper area in excess of 50%)Mounting Condition



SSIP-10



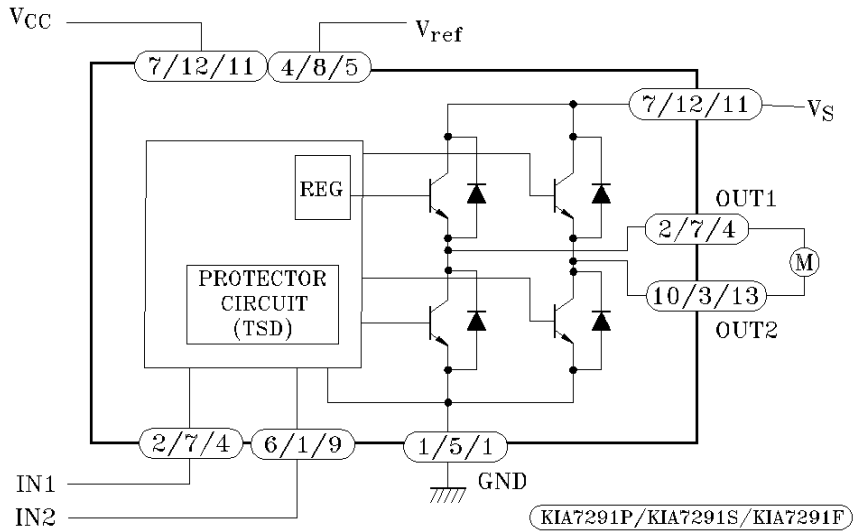
SIP-9



HSOP-16

# KIA7291P/S/F

## BLOCK DIAGRAM



## PIN FUNCTION

PIN No.			SYMBOL	FUNCTIONAL DESCRIPTION
P	S	F		
7	2	11	V <sub>CC</sub>	Supply voltage terminal for logic
8	6	15	V <sub>S</sub>	Supply voltage terminal for Motor driver
4	8	5	V <sub>ref</sub>	Supply voltage terminal for control
1	5	1	GND	GND terminal
5	9	7	IN1	Input terminal
6	1	9	IN2	Input terminal
2	7	4	OUT1	Output terminal
10	3	13	OUT2	Output terminal

P Type : PIN ③, ⑨ : NC

S Type : PIN ④ : NC

F Type : PIN ②, ③, ⑥, ⑧, ⑩, ⑫, ⑭, and ⑯ : NC

For F Type, We recommend FIN to be connected to GND.

## FUNCTION

INPUT		OUTPUT		MODE
IN1	IN2	OUT1	OUT2	
0	0	∞	∞	STOP
1	0	H	L	CW/CCW
0	1	L	H	CCW/CW
1	1	L	L	BRAKE

∞ : High Impedance

(Note) Inputs are all high active type.

# KIA7291P/S/F

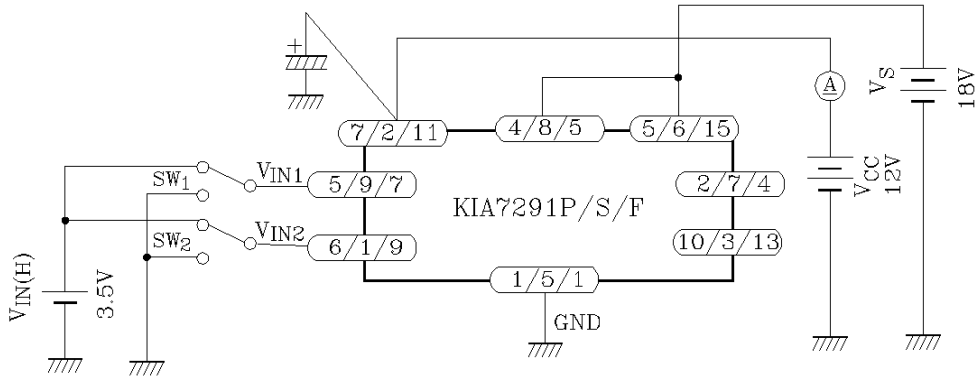
## ELECTRICAL CHARACTERISTICS

(Unless otherwise specified,  $V_{CC}=12V$ ,  $V_S=18V$ ,  $T_a=25^\circ C$ )

CHARACTERISTIC			SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current			$I_{CC1}$	1	Output OFF, CW/CCW mode	-	8.0	13.0	mA
			$I_{CC2}$		Output OFF, CW/CCW mode	-	0	50	$\mu A$
			$I_{CC3}$		Output OFF, Brake mode	-	6.5	10.0	mA
Input Operating Voltage	1 (High)	$V_{IN1}$	2	$T_j=25^\circ C$	-	3.5	-	5.5	V
	2 (Low)	$V_{IN2}$				GND	-	0.8	
Input Current		$I_{IN}$			$V_{IN}=3.5V$ , Sink mode	-	3	10	$\mu A$
Input Hysteresis Voltage		$\Delta V_T$			-	-	0.7	-	V
Saturation Voltage	P/S/F Type	Upper Side	$V_{SAT\ U-1}$	3	$V_{ref}=V_S$ , $V_{out}=V_S$ measure $I_O=0.2A$ , CW/CCW mode	-	0.9	1.2	V
		Lower Side	$V_{SAT\ L-1}$		$V_{ref}=V_S$ , $V_{out}=GND$ measure $I_O=0.2A$ , CW/CCW mode	-	0.8	1.2	
	S/F Type	Upper Side	$V_{SAT\ U-2}$		$V_{ref}=V_S$ , $V_{out}=V_S$ measure $I_O=0.4A$ , CW/CCW mode	-	1.0	1.35	
		Lower Side	$V_{SAT\ L-2}$		$V_{ref}=V_S$ , $V_{out}=GND$ measure $I_O=0.4A$ , CW/CCW mode	-	0.9	1.35	
	P Type	Upper Side	$V_{SAT\ U-2}$		$V_{ref}=V_S$ , $V_{out}=V_S$ measure $I_O=1.0A$ , CW/CCW mode	-	1.3	1.8	
		Lower Side	$V_{SAT\ L-2}$		$V_{ref}=V_S$ , $V_{out}=GND$ measure $I_O=1.0A$ , CW/CCW mode	-	1.2	1.85	
Output Voltage	S/F Type		$V_{SAT\ U-1'}$	3	$V_{ref}=10V$ , $V_{out}=GND$ measure $I_O=0.2A$ , CW/CCW mode	-	11.2	-	V
			$V_{SAT\ U-2'}$		$V_{ref}=10V$ , $V_{out}=GND$ measure $I_O=0.4A$ , CW/CCW mode	10.4	10.9	12.2	
	P Type		$V_{SAT\ U-3'}$		$V_{ref}=10V$ , $V_{out}=GND$ measure $I_O=0.5A$ , CW/CCW mode	-	11.0	-	
			$V_{SAT\ U-4'}$		$V_{ref}=10V$ , $V_{out}=GND$ measure $I_O=1.0A$ , CW/CCW mode	10.2	10.7	12.0	
Leakage Current	Upper Side		$I_{LU}$	4	$V_L=25V$	-	-	50	$\mu A$
	Lower Side		$I_{LL}$		$V_L=25V$	-	-	50	
Diode Forward Voltage	S/F Type	Upper Side	$V_{FU-1}$	5	$I_F=0.4A$	-	1.5	-	V
	P Type	Lower Side	$V_{FU-2}$		$I_F=1A$	-	2.5	-	
	S/F Type	Upper Side	$V_{FU-1}$		$I_F=0.4A$	-	0.9	-	
	P Type	Lower Side	$V_{FU-2}$		$I_F=1A$	-	1.2	-	
Reference Current			$I_{ref}$	2	$V_{ref}=10V$ , Source mode	-	20	40	$\mu A$

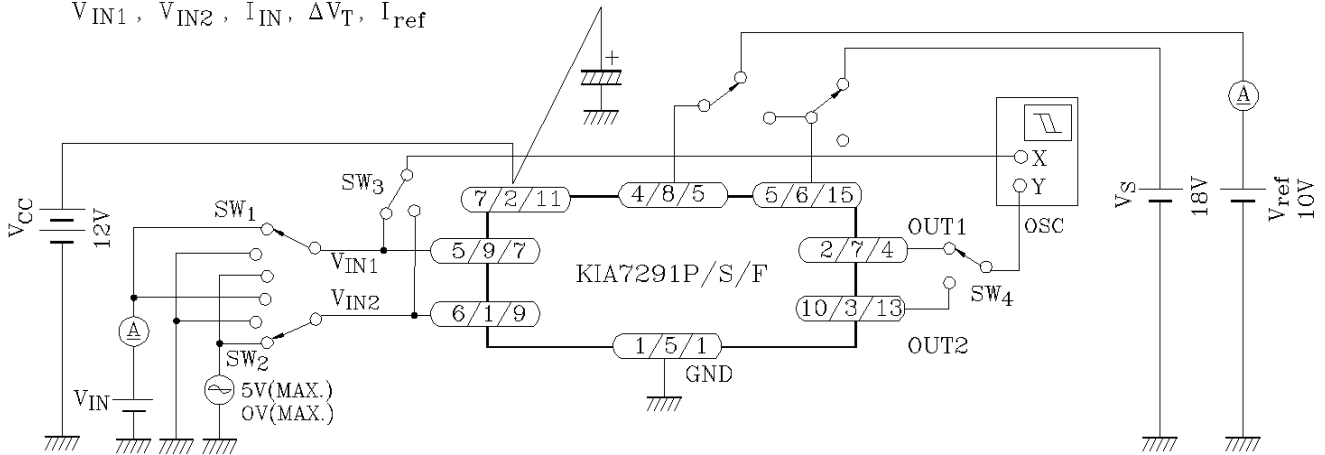
# KIA7291P/S/F

TEST CIRCUIT 1  
I<sub>CC1</sub>, I<sub>CC2</sub>, I<sub>CC3</sub>



(Note) HEAT FIN of KIA7291F is connected to GND.

TEST CIRCUIT 2  
V<sub>IN1</sub>, V<sub>IN2</sub>, I<sub>IN</sub>, ΔV<sub>T</sub>, I<sub>ref</sub>



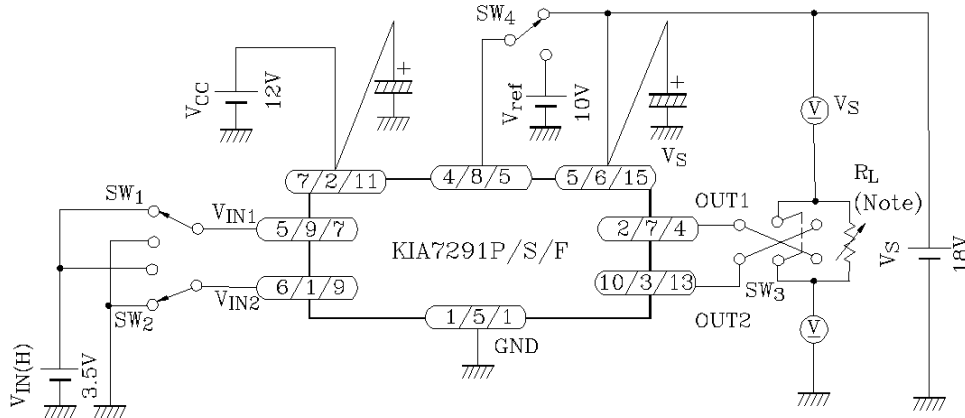
KIA7291P/KIA7291S/KIA7291F

(Note) HEAT FIN of KIA7291F is connected to GND.

# KIA7291P/S/F

## TEST CIRCUIT 3

$V_{SAT}$  U-1, 2, 3  $V_{SAT}$  L-1, 2, 3  $V_{SAT}$  U-1', 2', 3', 4'

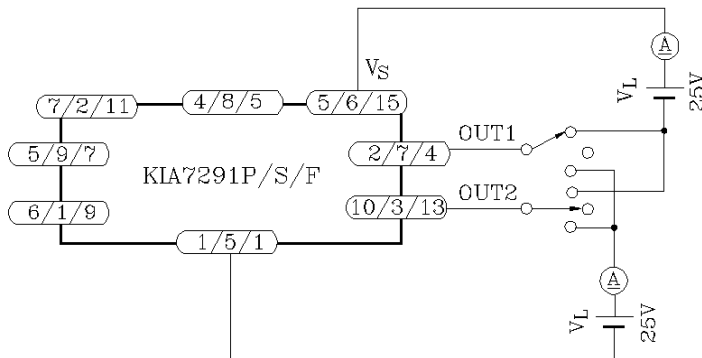


(Note)  $I_{OUT}$  calibration is required to adjust specified values of test conditions by  $R_L$  ( $I_{OUT}=0.2A/0.4A/0.5A/1.0A$ )

(Note) HEAT FIN of KIA7291F of connected to GND.

## TEST CIRCUIT 4

$I_L$  U, L

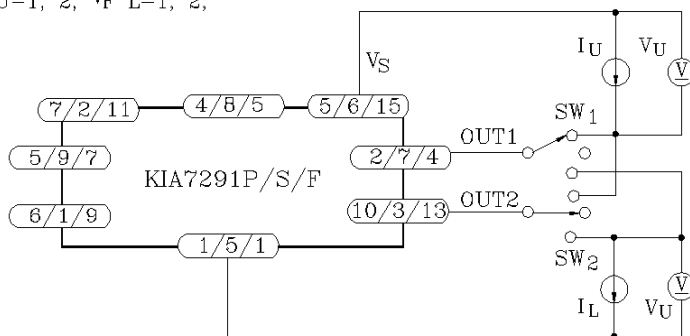


KIA7291P/KIA7291S/KIA7291F

(Note) HEAT FIN of KIA7291F of connected to GND.

## TEST CIRCUIT 5

$V_F$  U-1, 2,  $V_F$  L-1, 2,

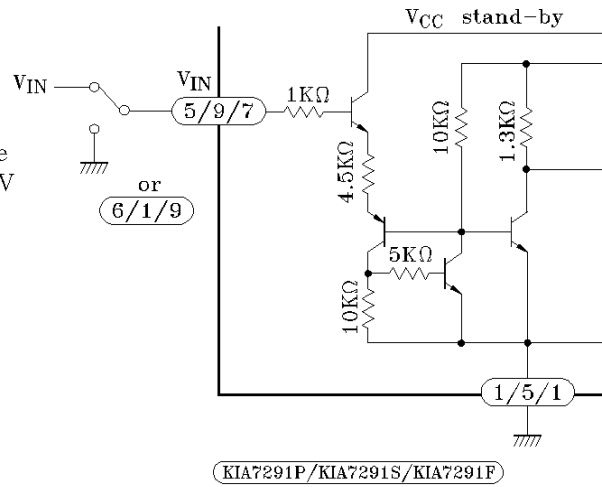


# KIA7291P/S/F

## NOTES

### Input circuit

Input Terminals of pin ⑤ and ⑥ (KIA7291P) are all high active type and have a hysteresis of 0.7V (typ.), 3μA(typ.) of source mode input current is required.



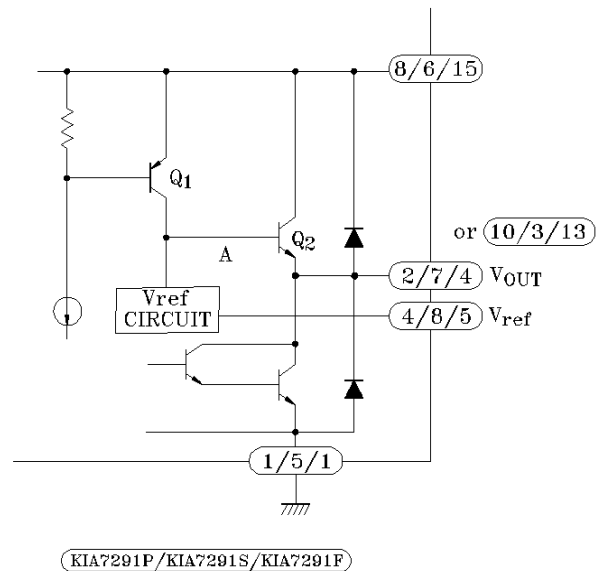
### Output circuit

Output voltage is controlled by  $V_{ref}$  voltage.

Relationship between  $V_{OUT}$  and  $V_{ref}$  is

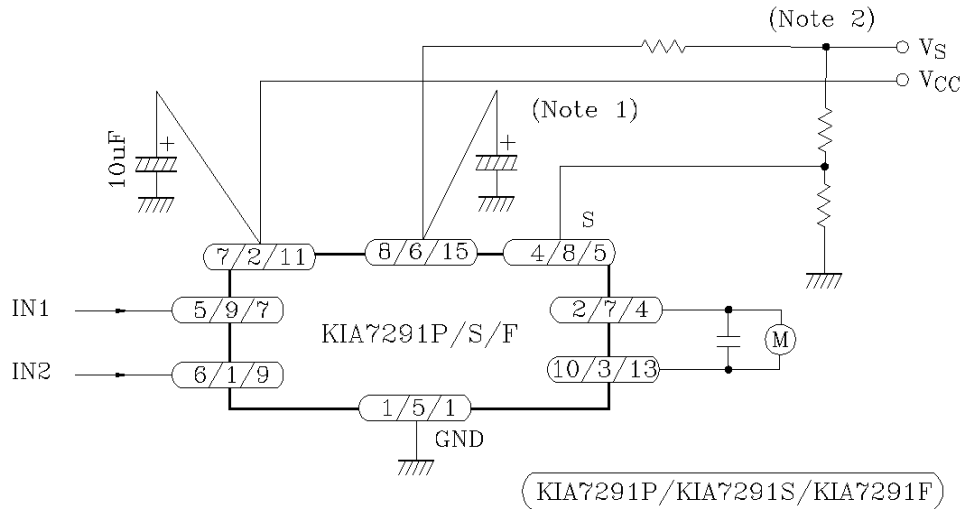
$$V_{OUT} = V_{BE} (\approx 0.7) + V_{ref}$$

$V_{ref}$  terminal required to connect to  $V_S$  terminal for stable operation in case of no requirement of  $V_{ref} \leq V_S$



# KIA7291P/S/F

## APPLICATION CIRCUIT



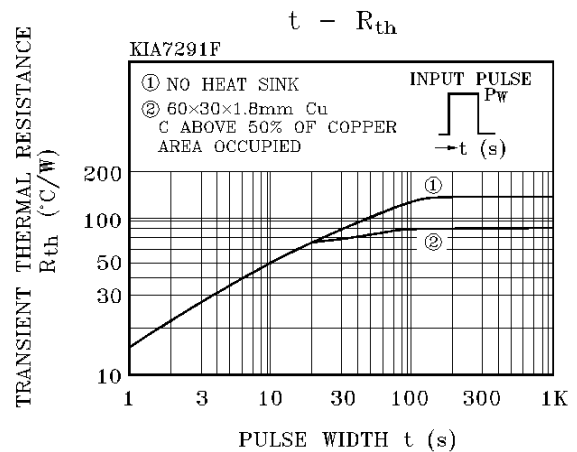
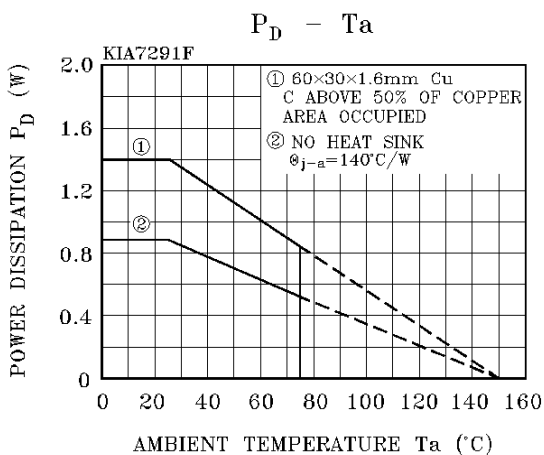
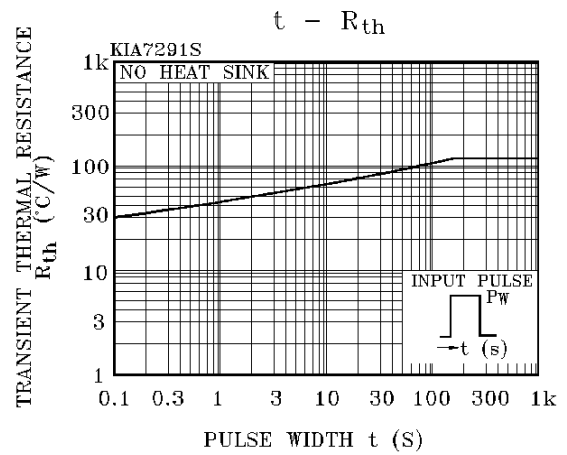
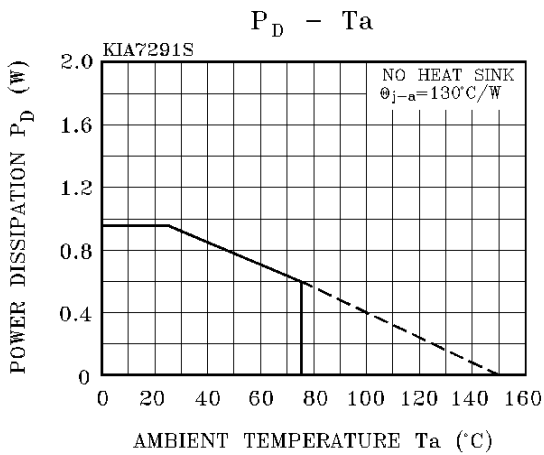
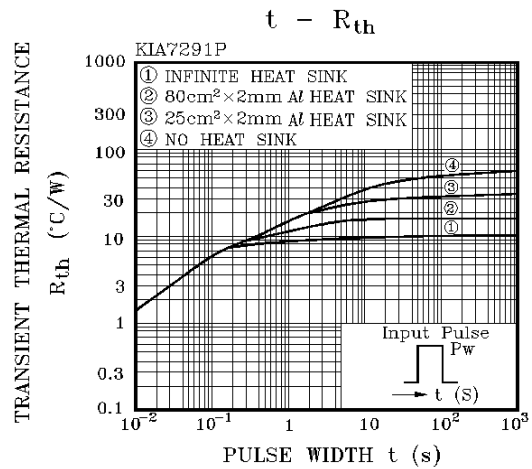
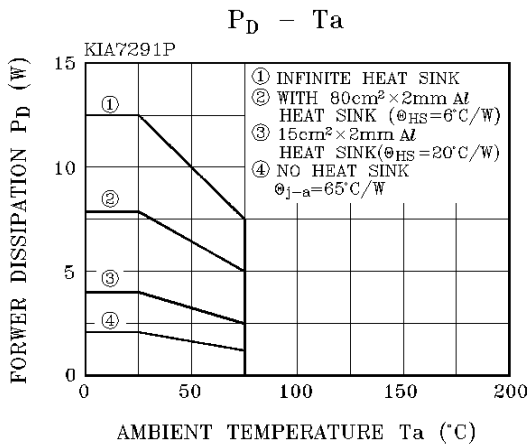
(Note1) Experiment to find the optimum capacitor value.

(Note2) To protect against excess current, current limitation resistor R should be inserted where necessary.

## NOTES

- Be careful when switching the input because rush current may occur.  
When switching, stop mode should be entered or current limitation resistor R should be inserted.
- The IC functions cannot be guaranteed when turning power on of off.  
Before using the IC for application, check that there are no problems.
- Utmost care is necessary in the design of the output line, V<sub>S</sub>, V<sub>CC</sub> and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

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